

Dr. Thomas R. Junk

Education

1984 – 1988 Massachusetts Institute of Technology, Cambridge, MA.

Bachelor of Sciences, Physics with Electrical Engineering

- Analyzed bubble-chamber pictures of 200 GeV protons incident on foil targets in a search for anomalous particles
- Wrote the data acquisition software for a muon chamber as a prototype for the LVD detector in the Gran Sasso laboratory near L'Aquila, Italy.
- Worked in a low-temperature condensed-matter laboratory at MIT. Constructed a cryostat probe for mounting multiple samples which could be cooled to liquid helium temperatures. Measured the properties of superconducting lanthanum cuprates with varying concentrations of lithium, barium, strontium and oxygen. Undergraduate thesis advisor: Marc Kastner

1988 – 1995 Stanford University, Stanford, CA. Research conducted at the Stanford Linear Accelerator Center.

Ph.D., High-Energy Physics

Thesis title: "Measurement of the Polarized Forward-Backward Asymmetry of b Quarks using Momentum-Weighted Track Charge at SLD" Degree conferred January 1996.

Thesis Supervisor, Rafe H. Schindler

Activities:

- Led the SLD Heavy-Flavor Asymmetries Working Group
- Wrote data-acquisition software for SLD's Compton polarimeter, which measured the polarization of 45-GeV electrons. Acquired data, logged tape, calculated online polarization, prepared history plots, and monitored integrity of collected data.
- Developed pattern-recognition software for SLD's central drift chamber
- Wrote offline data compression/decompression software
- Wrote software to monitor cryogenic quantities for the SLC superconducting final focus.
- Installed and tested liquid argon calorimeter readout electronics
- Measured the flavor-independence of α_s , the strong coupling constant.

Professional experience

- 1996—1998: **Scientific Associate** CERN, the European Organization for Nuclear Research, Geneva, Switzerland.
 - Measured W pair production rate in e^+e^- collisions at LEP, OPAL experiment at a center-of-mass energy of 161 GeV.
 - Measured R_b , the branching fraction of Z bosons to b quarks with <2% precision. Responsible for estimating tracking uncertainty, correlation uncertainty, and performing the final fit.
 - Helped build and align OPAL's upgraded silicon microvertex

detector. Used optical metrology techniques and alignment with cosmic-ray data.

- Responsible for charged particle tracking efficiency and resolution modeling of the OPAL detector.
- 1998 – 2001: **Postdoctoral Research Associate** Carleton University Department of Physics, Ottawa, Canada. Position resident at CERN.
 - Co-leader, Higgs Working Group, OPAL experiment, situated on the LEP accelerator
 - OPAL contact and supersymmetric Higgs boson search results combiner for the LEP Higgs Working Group
 - Responsible for operation and maintenance of OPAL's inner wire tracking chamber
 - Responsible for Carleton's safety shifts
- 2002—2007: **Assistant Professor of Physics**, University of Illinois at Urbana-Champaign, Urbana, IL
 - Member, CDF Collaboration, Fermi National Accelerator Laboratory, Batavia, IL
 - CDF's Run IIb silicon detector upgrade project: Designed a test station to read out the electronics – wrote, debugged, tested and commissioned firmware in VHDL to perform high-speed data acquisition tasks. Specified software requirements, evaluated, debugged and commissioned readout software written by my team.
 - Worked on Extremely Fast Tracker Stereo upgrade project – set up the test station at UIUC for the upgraded front-end mezzanine cards and wrote the preliminary test data acquisition programs (VxWorks). Debugged firmware and specified test procedure.
 - Designed and performed the likelihood discriminant analysis to search for single top quarks produced in high-energy collisions.
 - CDF Higgs Working Group co-leader, 2004 – 2007
 - CDF Statistics Committee member, 2004 – Present. Consultant on experiment design and optimization, and evaluation of the significance of results.
 - Reviewed CDF data analysis efforts
 - Tevatron New Physics Combination group member – 2006—Present.
 - Co-organized the January, 2006 CDF Higgs analysis workshop.
 - Teaching Experience: Freshman mechanics, Advanced mechanics, Undergraduate classical physics laboratory.
 - Designed a data-acquisition system for the classical laboratory. Wrote, debugged, tested firmware for it. Tested and installed hardware.
 - Refereed physics journal articles.
- September 2007-July 2009: **Guest Scientist**, Fermi National Accelerator Laboratory
 - Co-led CDF's single top working group – led to observation of the process.
 - Responsible for CDF's silicon cooling

- Continue responsibilities on CDF Statistics Committee, CDF Higgs Working Group. Co-convene the Tevatron New Physics and Higgs Working Group. Assist collaborators with statistical and analysis issues.
- Calibrated CDF's displaced vertex mistag rate matrices.
- July 2009 – Present: **Applications Physicist**, Fermi National Accelerator Laboratory
 - Responsible for CDF's silicon cooling: Solved operational problems, remained on call, organized repair work.
 - Convened the Tevatron New Physics and Higgs Working Group: collected and checked Higgs search results from CDF and D0, prepared combined results and documentation. Estimated future sensitivity of the experiments. Coordinated with theorists and defended our procedures. CDF contact person for the Tevatron/LHC Higgs combination (upcoming).
 - Member, CDF Statistics Committee – advise collaborators (and colleagues on other experiments) on statistical issues.
 - Member, LBNE collaboration
 - Offline Coordinator, LBNE Water Cherenkov Detector: Managed accounts, software installation, ran large simulation and reconstruction jobs, provided user support.
 - Convener, LBNE Water Cherenkov Detector Reconstruction Software Working Group
 - Chaired the Water Cherenkov Reconstruction and Analysis tools session at ANT11.
 - Organized a week-long Water Cherenkov reconstruction workshop, December 2011
 - Calibrated b-tagging efficiencies and mistags with a new neural-network b-tagger.
 - Reviewed grant proposals
 - Refereed journal articles

Publications	See additional pages for publication information and conference talks.
Professional memberships	American Physical Society
Languages and computing skills	Languages: English (mother tongue), French (fairly fluent), German (rusty). Computer languages: C, C++, Fortran, VHDL, Perl, shell scripting. Unix/Linux, Windows, Macintosh, VAX/VMS, IBM Mainframe experience. Assembly language for some older processors.
Awards received	<ul style="list-style-type: none"> • 1984—1988: National Merit Scholarship, Amoco Foundation • 1986: Joel M. Orloff award for Excellence in Undergraduate Physics Research • 1988: Member, Phi Beta Kappa, MIT • 1988—1992: National Science Foundation Graduate Fellowship • 1991: Robert Hofstadter Fellowship, Erice Summer Institute

Invited talks at Conferences and Seminars Since 2005:

“Results from the Tevatron”, LHCPHENO Winter School, Ascona, Switzerland, January 2012.

“Statistical Methods in High Energy Physics”: Pauli series lectures at ETH Zurich, January-February 2012.

“Tevatron Higgs Combination”, Talk presented at the Brookhaven Higgs Cross Section Workshop, May 6, 2011.

“Banff Challenge 2 Results”, PHYSTAT 2011, January 18, 2011.

“Tevatron Higgs Searches”, Seminar at Argonne National Laboratory, October 19, 2010.

“Tevatron Higgs Searches”, Seminar at the University of Maryland/Johns Hopkins University, October 13, 2010.

“Tevatron Higgs Combination”, Higgs Hunting, Orsay, 2010.

“Experimental Summary”, Higgs Hunting, Orsay, 2010.

“Practical Issues Related to Discovery and Limits”, and also a talk on “Banff Challenge 2”, Banff BIRS Workshop on Statistics of Discovery Claims, July 2010.

“Tevatron Searches for the SM Higgs Boson in the WW Decay Mode”, Notre Dame, March 30, 2010.

TRIUMF Summer Institute Statistics Lecture series, July 2009.

CERN Seminar on CDF, D0, and Combined Standard Model Higgs Boson Searches, June 23, 2009.

“Statistical Issues at the Tevatron and LHC” – TeV4LHC Forum, The Cosener’s House, May 7-8, 2009.

“CDF’s Higgs Boson Searches” Seminar, University of Glasgow, May 6, 2009.

“Higgs Theory Mini-Review” CMS JTERM School, Fermilab, January 15, 2009.

“Single Top Production Cross Sections at the Tevatron” ICHEP 2008 presentation, July 30, 2008.

“Measurement of Single Top Production with CDF” Fermilab Joint Experimental-Theoretical Physics seminar, March 28, 2008.

“Higgs Searches at the Tevatron”, Northwestern University High-Energy Physics Seminar, October 29, 2007.

“Higgs Searches at the Tevatron”, University of Chicago High-Energy Physics Seminar, October 22, 2007.

“Evidence for Single-Top Production at CDF”, Brookhaven National Laboratory High-Energy Physics Seminar, August 30, 2007.

“Prospects for a Low-Mass Higgs Boson”, Colliders to Cosmic Rays 2007, February 27, 2007.

“P-Values and Nuisance Parameters,” Talk presented at the Workshop on Statistical Inference Problems in High-Energy Physics and Astronomy, Banff International Research Station, July 15--20, 2006.

“Higgs Hunting at Hadron Colliders”, Invited talk, APS April Meeting, 2006 Dallas, TX, April 21-25, 2006.

“Statistical Methods for New Particle Searches”, UIUC Nuclear Physics seminar, February 1, 2006.

“Higgs Boson Searches at CDF”, UIUC HETEP Seminar, November 7, 2005.

“SM and MSSM Higgs Search Sensitivity”, Tev4LHC Workshop, Fermilab, October 21, 2005.

“SM and MSSM Higgs Boson Searches with CDF”, Fermilab Joint Experimental-Theoretical Seminar, September 30, 2005.

“Searching for the Origin of Mass”, Physics Department Colloquium, Wayne State University, Detroit, MI, September~15, 2005.

“Searches for the Standard Model Higgs Boson with CDF”, Frontiers in Contemporary Physics III, Vanderbilt University, May 23--28, 2005.

Selected Recent Publications and Preprints

T. Aaltonen *et al.*, [The CDF and D0 Collaborations] “Combination of Tevatron searches for the standard model Higgs boson in the WW decay mode”, Phys. Rev. Lett. **104**, 061802 (2010).

The CDF and D0 Collaborations, and the Tevatron New Phenomena and Higgs Working Group, “Combined CDF and D0 Upper Limits on Standard-Model Higgs-Boson Production”, arXiv:1107.5518 (2011).

The CDF and D0 Collaborations, and the Tevatron New Phenomena and Higgs Working Group, “Combined CDF and D0 Searches for the Standard Model Higgs Boson Decaying to Two Photons with up to 8.2 fb^{-1} of Data”, arXiv:1107.4960 (2011).

The CDF and D0 Collaborations, and the Tevatron New Phenomena and Higgs Working Group, “Combined CDF and D0 upper limits on $gg \rightarrow H \rightarrow WW$ and constraints on the Higgs boson mass in fourth-generation fermion models with up to 8.2 fb^{-1} of data”, arXiv:1108.3331 (2011).

The CDF and D0 Collaborations, and the Tevatron New Phenomena and Higgs Working Group, “Combined CDF and D0 upper limits on Fermiophobic Higgs Boson Production with up to 8.2 fb^{-1} of data”, arXiv:1109.0576 (2011).

The CDF and D0 Collaborations, and the Tevatron New Phenomena and Higgs Working Group, “Combined CDF and D0 upper limits on MSSM Higgs boson production in tau-tau final states with up to 2.2 fb^{-1} ”, arXiv:1003.3363 (2010).

A. Heinson and T. Junk, “Observation of Single Top Quark Production”, Ann. Rev. Nucl. Part. Sci. **61**, 171 (2011).

A. Abulencia *et al.*, [CDF Collaboration] “Observation of Single Top Quark Production and Measurement of $|V_{tb}|$ with CDF”, Phys. Rev. D **82**, 112005 (2011).

A. Abulencia *et al.*, [CDF Collaboration], "Observation of Electroweak Single Top Quark Production", Phys. Rev. Lett. **103**, 092002 (2009).

G. Bernardi, M. Carena, and T. Junk, "Higgs Bosons, Theory and Searches", review for the 2010 Particle Data Group Report.

A. Abulencia *et al.*, [CDF Collaboration]
"Search for $Z\text{prime} \rightarrow e^+e^-$ using dielectron mass and angular distribution", Phys. Rev. Lett. **96**, 211801 (2006).

A. Abulencia *et al.*, [CDF Collaboration], "The CDF Run IIb Silicon Detector: Design, Preproduction, and Performance", Nucl. Instrum. Meth. A **556** 459-481 (2006).

G. Abbiendi *et al.*, [OPAL Collaboration], "Search for neutral Higgs bosons in CP-conserving and CP-violating MSSM scenarios," Eur. Phys. J. C **37**, 49 (2004)
[arXiv:hep-ex/0406057].

ALEPH, DELPHI, L3 and OPAL Collaborations, and the LEP Higgs Working Group,
"Search for neutral MSSM Higgs bosons at LEP", Eur. Phys. J. C **47**, 547 (2006).

ALEPH, DELPHI, L3 and OPAL Collaborations, and the LEP Higgs Working Group,
"Search for the standard model Higgs boson at LEP," Phys. Lett. B **565**, 61 (2003)
[arXiv:hep-ex/0306033].